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APPRAISAL OF STAND RISK FOR SARATOGA SPITTLEBUG ON THE CHIPPEWA NATIONAL FOREST - 1980

by

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INTRODUCTION

Several damage detection reports received from foresters on the Chippewa National Forest indicated that Saratoga spittlebug, Aphrophora saratogensis (Fitch), populations may be building up in young red pine, Pinus resinosa Ait., plantations.

The Saratoga spittlebug is a small brownish insect that feeds on several species of pine. Red pine is preferred by the adult spittlebug, but jack pine, Pinus banksiana Lamb., white pine, Pinus strobus L., and Scots pine, Pinus sylvestris L., are also hosts. The immature stages, or nymphs, require an alternate host to develop on. Sweetfern, Comptonia peregrina (L.) Coult., is the most important alternate host, but willows, Salix spp., and brambles, Rubus spp. are also excellent alternate hosts.

The feeding activity of the adult spittlebug punctures the bark causing a necrotic area to form in the cambium and adjacent xylem. The resultant scar tissue inhibits or blocks water conduction causing chlorosis, shoot deformation, dieback, and in severe cases tree death. Young plantations between 2 and 15 feet can be seriously damaged by the spittlebug, particularly when there is an abundance of alternate hosts present.

In response to the damage detection reports, a survey of red pine plantations in the susceptible size range was conducted by the Forest Pest Management group between June 9 and July 11, 1980.

OBJECTIVE

The objective of this survey was to identify red pine plantations on the Chippewa National Forest that had been attacked or had a high potential of being attacked by the Saratoga spittlebug.

METHODS

Forest personnel provided Forest Pest Management with computer sorted lists and compartment maps of 245 red pine plantations totaling 7,298 acres (2,953 ha) with trees in the susceptible size range of 2-15 feet (0.6-4.6 m). A total of 216 stands were examined; the balance were not examined due to poor accessibility, road closures, or bald eagle management. The criteria used in determining stand risk were: feeding scars, flagging, crooking, tree size, stocking levels, tree vigor, stand closure, and the amount and variety of alternate hosts present.

Feeding scars are a good index for assessing spittlebug population levels, therefore, samples were taken at each plantation. Scar counts for 1979 spittlebug populations were obtained by peeling the bark from a 4-inch (10-cm) sample cut from the penultimate (second to last) internode of a branch in the upper crown of sample red pines. Approximately 10 scar count samples were taken at each plantation. In addition, third and fourth year internodes were examined for indications of past spittlebug population levels.

After data collection was completed, a relative risk rating based on average stand conditions was assigned. Risk categories as related to average stand conditions are summarized in Table 1. For some stands, the decision was obvious. High risk was assigned when 1979 scar counts were in excess of 20 per sample or when there was considerable flagging in the stand. For other stands, the rating was more intuitive and arrived at after considering all available information.

Table 1.--Relative risk rating factors considered in evaluating red pine plantations for Saratoga spittlebug, Chippewa National Forest, July 1980

Risk category	1979 feeding scars	Earlier feeding scars	Crooking & flagging	Alternate hosts	Stand closure	Stand vigor
Low	≤ 4	few	none	some	closing	good
Moderate	5-8	some	little	considerable	open	fair
High	≥ 9	many	considerable	abundant	open	poor

A risk rating was chosen that most closely fit categories described above. Considerable weight was given to 1979 feeding scar counts, past heavy feeding and the presence of flagging in the stands. Rather than indicating a potential for spittlebug buildup, these factors are evidence that past populations have actually reached high levels.

RESULTS

The scar count samples revealed that while there were very high spittlebug populations feeding in several plantations three and four years ago, current population levels are generally low.

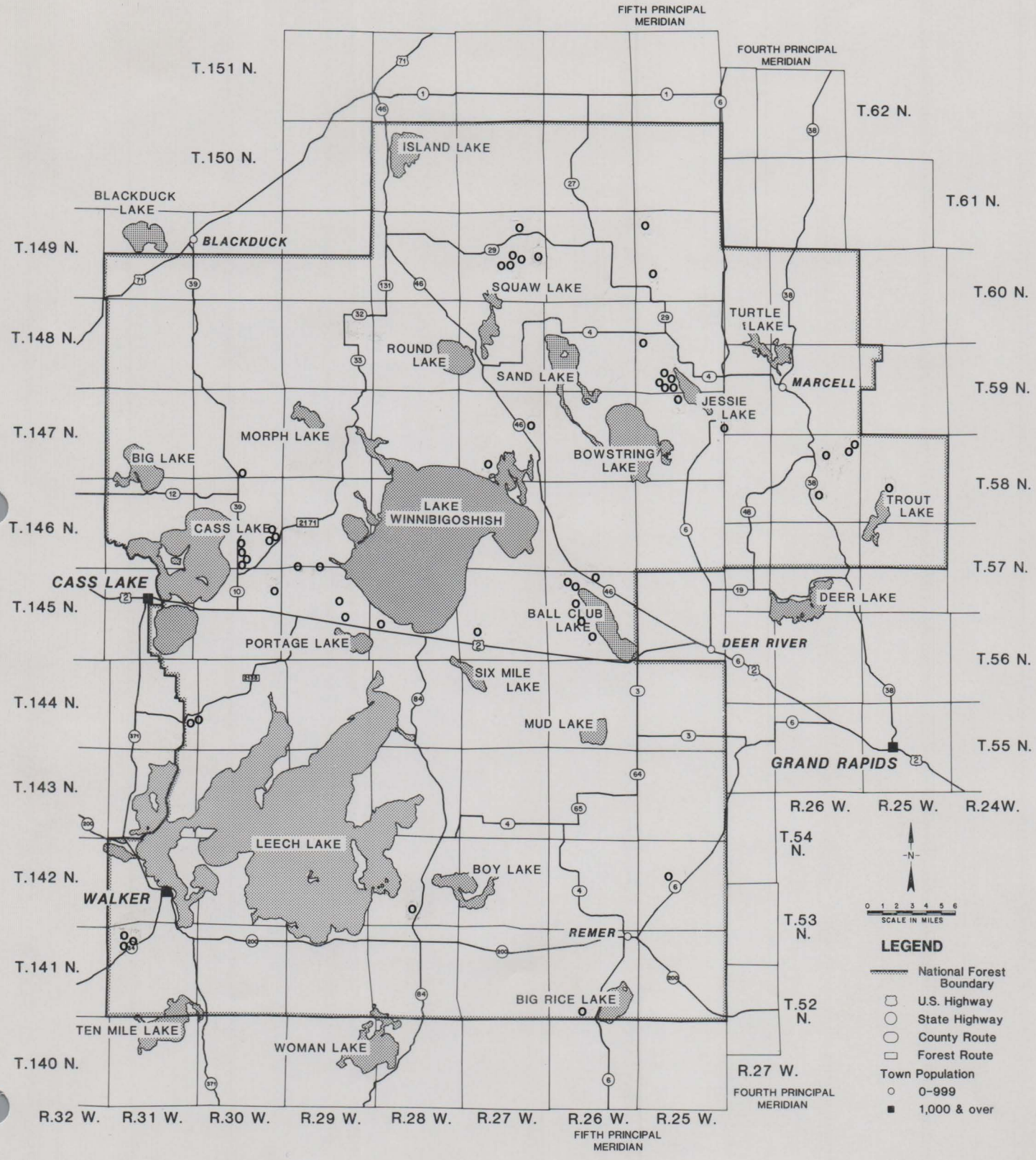
Of the 216 stands (6543 ac, 2648 ha) examined, 32 stands (1176 ac, 476 ha) were classified high risk, 25 stands (678 ac, 274 ha) were classified moderate risk, and 159 stands (4689 ac, 1898 ha) were considered low risk (Table 2). Twenty-six percent of the stands were in the moderate and high risk categories Forest-wide. The percent of moderate and high risk stands varied by district from 12 to 41 percent.

Table 2.--Saratoga spittlebug stand risk rating summary, Chippewa National Forest, July 1980

District	Stands inspected	Low risk	Moderate risk	High risk	Percent moderate & high risk
Black Duck	29	17	7	5	41
Cass Lake	63	48	5	10	24
Deer River	43	33	5	5	23
Marcell	40	25	7	8	38
Walker	41	36	1	4	12
Forest Total	216	159	25	32	
Percent	100	74	11	15	26

Spittlebug activity appears to be concentrated in the central and northern portions of the Forest. Distribution of high and moderate risk stands found during the survey is shown in Figure 1.

Figure 1.--Distribution of high and moderate risk Saratoga spittlebug stands, July 1980



o- High or moderate risk stand

DISCUSSION

According to Ewan (1961), twig mortality and growth deterioration will generally occur in one or two seasons in trees that exhibit 35 or more feeding scars per 10 centimeters of the two year old internodes. While few counts of that magnitude were found while sampling the penultimate internode, scar counts much higher than that were obtained from three and four year old internodes in several plantations. This high spittlebug activity in the past accounts for the flagging currently seen in some of the plantations.

Damage is always most severe where there is an abundance of alternate hosts available for the spittlebug nymphs (Wilson, 1978). Our inspections found very little sweetfern present in any of the stands, but many did contain an abundance of willow and brambles. A variety of other alternate host species was also found.

An unexplained reduction in spittlebug populations occurred between 1978 and 1979 as evidenced by the relatively few high 1979 scar counts. However, the extremely high scar counts attributable to earlier spittlebug populations indicate that conditions do exist in some plantations which favor future outbreaks.

RECOMMENDATIONS

There are two recommendations concerning spittlebug management on the Chippewa National Forest:

1. Forest personnel should increase surveillance efforts on high and moderate risk stands and on those low risk stands with considerable alternate hosts (Appendix Tables 1-5). If apparent spittlebug population increases are detected and serious consideration is being given to suppression, a biological evaluation could be performed at that time to determine the need for direct control in 1982.

2. Reforestation specialists should make risk evaluations before establishing red pine plantations. Wilson (1971) has developed an easy, inexpensive method of risk-rating areas being considered for red pine planting. The method requires an ocular estimate of the percent sweetfern and the percent of other alternate host plants. These estimates are plotted against a spittlebug risk-rating triangle graph (FS R9 Reforestation Handbook 2472.1, Chapter 110) to determine potential injury level. Such a survey will help the manager identify areas where spittlebugs could become a problem.

ACKNOWLEDGEMENTS

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A P P E N D I X

Appendix Table 1.--Stand risk ratings, Black Duck Ranger District, Chippewa National Forest, Saratoga spittlebug survey, July 1980

Comp.	Stand	Risk*	Acres	Comments
4	24	L	19	
34	14	NE	23	Poor stocking - not susceptible size
63	14	L	28	
63	21	L	42	Alt. host abundant
63	23	L	72	Trees 12'-14'
63	33	L	7	
63	38	L	5	
101	31	L	18	
101	37	NE	32	
123	16	H	21	Alt. host - some flagging - avg. 8 scars
128	1	NE	32	
131	13	L	30	Alt. host present - trees 10'-12'
135	25	L	24	Trees 15'-20'
140	11	L	63	Recent herb. treatment - much browning
181	7	L	51	Trees are out of susceptible size
181	36	L	3	Trees are out of susceptible size
189	20	M	20	Alt. host present - avg. 5 scars
204	16	H	58	Flagging - Avg. 14 scars
207	3	M	23	Alt. host present - avg. 6 scars
207	13	M	7	Alt. host present - avg. 6 scars
224	16	L	69	Trees 12'-14'
225	16	L	37	Trees 12'-14'
227	3	L	26	Trees 10'-12'
231	23	H	53	Some flagging - avg. 13 scars - alt. host abundant
231	24	H	3	Some flagging - avg. 13 scars - alt. host abundant
242	18	L	29	Stand being converted to spruce
246	16	M	34	Spotty activity - avg. 6 scars - some flags
246	17	M	16	Spotty activity - avg. 6 scars - some flags
249	1	L	23	Recent herb. treatment - some needle droop
262	25	M	73	Abundant alt. host - some flags - trees 10'-12'
264	6	H	11	Flagging - avg. 8 scars
272	35	M	27	Abundant alt. host - spittle masses present
Totals	32		979	

* L - Low
M - Moderate
H - High
NE - Not examined

Appendix Table 2.--Stand risk ratings, Cass Lake Ranger District, Chippewa National Forest, Saratoga spittlebug survey, July 1980

Comp.	Stand	Risk*	Acres	Comments
6	7	L	40	Considerable alt. host material
7	24	L	36	Stand nearly out of susceptible size
10	20	L	23	Stand nearly out of susceptible size
15	26	L	16	Alt. host present
16	14	H	83	Alt. host abundant - considerable flags
19	10	M	31	Flagging may be from herbicide - low scars
27	5	H	14	Some flagging and crooking - avg. 9 scars
27	9	H	49	Avg. 11 scars
27	12	H	39	Some flags - avg. 13 scars
31	50	H	52	Flags - avg. 31 scars - Diplodia possible
31	52	H	75	Flags & crooking - avg. 7 scars
33	18	M	46	Some activity - nearly out of susceptible size
33	19	H	31	Alt. host abundant - some flags - avg. 7 scars
51	4	H	39	Consider converting - stand severely damaged
53	34	L	50	Stock too small
53	36	L	9	Stock too small - Herbicide damage
53	10	L	23	Alt. host present
56	8	L	67	Considerable alt. host - monitor
56	10	L	62	Considerable alt. host - monitor
57	1	L	8	Considerable alt. host - monitor
57	6	L	16	Some feeding
57	25	L	38	Considerable alt. host - monitor
57	30	L	19	Trees too small
57	35	L	2	Considerable alt. host - trees small - monitor
57	36	L	27	Considerable alt. host - trees small - monitor
61	11	NE	54	
63	2	L	74	Alt. host abundant - monitor
65	4	L	26	
65	9	NE	5	
65	11	L	13	Wrong type - A lot of spruce
70	5	L	22	Trees too small - alt. host abundant
74	9	NE	80	
84	10	L	49	Some alt. host
100	40	L	24	
101	1	L	4	Abundant alt. host - some scars - monitor
101	3	L	46	Abundant alt. host - some scars - monitor
101	5	M	8	Avg. 6 scars - Alt. host abundant
101	6	M	36	Avg. 6 scars - Alt. host abundant
101	10	NE	19	
101	14	L	6	Stands are closing
101	15	L	45	Stands are closing
110	5	L	54	

110	14	L	17	
115	11	H	40	Heavy past feeding - some flags
115	13	NE	114	
115	16	NE	4	
115	19	L	35	
115	37	M	31	Considerable alt. host - evidence of feeding
116	2	L	18	Alt. host present - monitor
116	5	L	63	
116	9	L	7	
116	10	L	6	Alt. host present
117	3	L	88	
117	12	H	88	Some flagging & crooking - avg. 7 scars
117	16	L	9	Alt. host abundant
119	11	L	31	Abundant alt. host-monitor
119	12	L	13	Alt. host abundant
119	27	L	42	Stock too small
121	46	L	16	
121	47	L	16	
123	19	L	76	
123	26	NE	15	
123	38	L	41	
128	2	L	60	
128	8	L	67	Stand looks poor in general - check
128	11	L	87	Trees over susceptible size
134	21	NE	33	
140	37	L	37	Stand starting to close
140	48	L	56	Stand closing
140	55	L	32	
140	69	L	6	Trees too small
Totals	71		2608	

* L - Low
  M - Moderate
  H - High
 NE - Not examined

Appendix Table 3.--Stand risk ratings, Deer River Ranger District, Chippewa National Forest, Saratoga spittlebug survey, July 1980

Comp.	Stand	Risk*	Acres	Comments
18	25	L	25	Mostly aspen
18	26	L	10	A lot of aspen and grasses
21	6	L	5	Alt. host abundant
21	9	L	20	Some alt. host & some SSB - monitor
27	37	NE	7	
32	17	L	9	
32	25	L	12	Some alt. host
37	20	L	38	
46	30	NE	3	
54	38	L	2	Too small
55	11	H	19	Flagging - avg. 16 scars - heavy past feeding
58	43	L	10	
63	17	H	171	Spotty SSB - alt. host abundant - avg. 14 scars
68	2	L	10	
68	4	L	18	
82	17	L	17	
106	11	L	20	Stand closing - trees > 14'
106	27	L	23	Stand closing - trees > 14'
106	29	L	41	Stand closing - trees > 14'
106	32	L	44	Stand closing - trees > 14'
107	14	L	21	
107	18	L	11	
126	37	L	13	Some alt. host
133	4	NE	13	Eagle zone
133	10	NE	30	Eagle zone
133	21	NE	29	Eagle zone
133	32	L	15	
134	12	M	9	Some flagging - alt. host present - monitor
134	14	M	16	Some flagging - alt. host present - monitor
135	13	H	47	Some flags & crooking - heavy past feeding
135	20	L	33	Recent fire in stand
141	6	H	12	Flags & crooking - abundant alt. host
141	53	L	6	Trees small
142	12	L	20	
143	41	L	16	
152	18	H	13	Abundant alt. host - flags - heavy past feeding
153	16	M	24	Alt. host present - A few flags - monitor
159	27	L	4	
159	35	L	25	
159	37	L	5	
159	39	M	14	Some flagging - alt. host present - monitor
186	11	NE	42	Road to area closed

202	18	NE	22	Road to area closed
202	38	NE	4	Road to area closed
236	2	L	23	
236	8	L	12	
247	4	L	6	Some alt. host
247	5	L	30	
249	1	L	11	
249	2	L	2	
261	30	M	65	Previous feeding - some flagging - monitor
Totals	51		1097	

* L - Low
M - Moderate
H - High
NE - Not examined

Appendix Table 4.--Stand risk ratings, Marcell Ranger District, Chippewa National Forest, Saratoga spittlebug survey, July 1980

Comp.	Stand	Risk*	Acres	Comments
46	9	H	13	Considerable flagging
48	39	M	29	Avg. 13 scars - alt. host present
49	23	H	25	Avg. 16 scars
49	26	H	6	Avg. 26 scars - alt. host abundant
49	27	M	55	Avg. 13 scars - alt. host present
49	33	H	4	Avg. 16 scars
53	10	L	28	Trees too small
53	27	H	13	Avg. 13 scars - weakened by herbicide - - watch
56	5	L	21	
56	18	L	33	Alt. host abundant - recent herbicide treatment
56	48	L	17	Alt. host abundant - recent herbicide treatment
58	29	H	4	Considerable mort. heavy scars - recent herbicide
68	3	L	9	Alt. host present
68	11	L	21	Alt. host present
68	26	L	15	Considerable alt. host
68	30	L	67	Considerable alt. host
69	95	NE	9	
69	98	L	48	
69	99	L	5	
75	54	L	23	Trees 15'-20'
90	13	L	28	Some alt. host - some feeding - monitor
90	35	L	29	Some alt. host - some feeding - monitor
90	58	L	32	
96	8	M	14	Alt. host abundant - avg. 5 scars
97	1	M	13	Alt. host abundant - avg. 5 scars
97	20	L	53	
97	33	L	7	Considerable alt. host - monitor
97	35	L	7	Considerable alt. host - monitor
99	19	H	61	Alt. host abundant - Avg. 11 scars
106	14	M	30	Abundant alt. host - Avg. 5 scars
106	56	L	32	Stand closing
110	7	L	4	Alt. host abundant - monitor
112	5	L	11	Stand beginning to close
112	17	M	15	Avg. 5 scars
136	1	L	12	Trees 15'-20'
136	2	L	17	Trees 15'-20'
141	31	L	22	
146	29	NE	29	
146	72	L	43	Possible burning by herbicide
146	134	L	4	Possible burning by herbicide
154	36	M	31	Avg. 5 scars
155	14	NE	5	
173	42	H	3	Avg. 11 scars - heavy previous feeding - monitor
Totals	43		947	

* L - Low
M - Moderate
H - High
NE - Not examined

Appendix Table 5.--Stand risk ratings, Walker Ranger District, Chippewa National Forest, Saratoga spittlebug survey, July 1980

Comp.	Stand	Risk*	Acres	Comments
16	3	L	5	
16	5	L	8	Some feeding
16	8	L	16	Alt. host abundant - some feeding
17	4	L	22	Abundant alt. host
17	5	L	25	Abundant alt. host
17	14	NE	25	
17	17	NE	18	
45	1	L	96	
45	4	L	53	
45	5	L	27	Some alt. host material
45	7	L	40	Some alt. host material
47	28	H	8	Alt. host abundant - flags - avg. 9 scars
48	1	L	182	
48	12	L	7	Monitor - some flags
49	6	L	36	Stand is closing
51	2	L	9	Stand is closing
51	4	L	30	Stand is closing
51	6	L	39	Some feeding
57	3	L	44	Abundant alt. host
72	17	L	63	Stand is closing
72	27	L	11	Stand is closing
81	12	L	11	Alt. host present
81	14	L	24	Alt. host present - some feeding - monitor
87	7	NE	6	
88	7	NE	25	
88	19	NE	46	
97	20	H	80	Abundant alt. host - flagging - avg. 6 scars
98	2	H	16	Alt. host abundant - flagging - avg. 17 scars
98	5	H	25	Avg. 12 scars - flagging
98	24	L	10	Trees too small
101	10	L	17	Alt. host abundant
138	23	L	23	
138	34	L	94	
138	50	NE	20	
180	15	NE	11	
181	10	L	41	Alt. host abundant
181	14	L	30	
184	6	L	132	
184	7	L	37	
184	11	L	40	
185	20	L	65	
185	40	L	5	
201	3	L	10	
201	5	L	38	
201	13	L	59	
201	22	M	11	Abundant alt. host.- avg. 5 scars
201	32	L	14	
201	34	L	13	
Totals	48		1667	

* L - Low H - High
M - Moderate NE - Not examined